Carbon Footprint and Carbon Handprint Post-Calculation of the Infrastructure Project at Kulloo

Summary of the pilot report 04/2023, the CO2 DataHub project

Name of the pilot	Carbon Footprint and Carbon Handprint Post-Calculation of the Infrastructure Project at Kulloo
Project team	Vastuu Group and Sitowise Group Oyj
Participants	Platform of Trust, Onway Oy

Finland aims for carbon neutrality by 2035.
The CO2 DataHub research and development project supports this goal by developing methods for the gathering, evaluation and data-based management of carbon dioxide emissions in the supply chains of companies and cities.

In the CO2 DataHub project, Sitowise and Vastuu Group executed a pilot project for the following five cities: Espoo, Lohja, Porvoo, Tampere and Raisio. The use case for the City of Porvoo's pilot project was the carbon footprint and carbon handprint of the Kulloo business district infrastructure project. The City of Porvoo has worked persistently to advance circular economy in ground and bedrock construction and the ground construction works at the Kulloo business district is no exception. The circular economy goals of the city are affected by national goals, i.e. the Waste Act amendment and the National Waste Plan to 2023 and their aim is to increase construction sites' waste (including earth material) reclamation percentage to 70%. As for the Kulloo area, the city wanted to test out the working methods that would have significant impacts on construction emissions and costs.

This pilot project examined how the data transmission process could be automated from the project bank used by the City of Porvoo to Sitowise's Louhi system, where the CO2 calculations and visualization will be executed. This automation process was piloted with a prototype, consistent data collection model and a calculation instruction. These were tested with the data collected by the contractor, available fuel emission factor data retrieved from databases as well as expert reviews. The post-

calculation of the project's carbon footprint and handprint was executed with the available data.

Today, municipalities and larger companies already have to report their environmental impacts. In addition to complying with rules and regulations, public agents and companies want to monitor their greenhouse gas emissions to generate information for the inhabitants and customers, but also to be able to manage their operations on the basis of the calculated data.

The City of Porvoo has a lot of different kinds of information regarding infrastructure projects but there are no clear tools to utilize this data in the assessment of carbon footprints and handprints or the impacts of circular economy. During the Kulloo infrastructure project, data collection guidelines for soil management and a pilot calculation using the fuel consumption data of transportation and machinery collected by the contractor, database data on fuel emission factors and expert reviews were produced.

In the case of the City of Porvoo's project, the assessed carbon footprint consists of the emissions caused by transportation and the fuel consumption of machinery. The assessed carbon handprint, on the other hand, consists of the emissions avoided thanks to soil management. The City of Porvoo had obligated the contractor to collect data on the fuel consumption of machinery and transportations as well as on the travelled distances. This data was documented to the SokoPro project bank by the contractor. This enabled the examination of data transmission automation from this project bank to Sitowise's Louhi system.

The prototype utilized the available data, and the carbon footprint and handprint of the infrastructure project were calculated and visualized. The carbon handprint, i.e. the savings/emission benefits, were presented with the help of a scenario calculation. In addition, the impacts of different solutions in relation to the whole entity were presented. The results of the carbon footprint and handprint calculations were visualized into Sitowise's Louhi system's Power BI environment that simulates customer's user interface. In the Power BI view, it is possible to review the machinery and transportation emissions separately.

As a result of this pilot project, the City of Porvoo received information on the emission benefits incurred by the circular economy principles and on the carbon handprint, i.e. the avoided emissions, thanks to the internal soil management. Due to using soil management in the building phase, the excavated and mined soil and rock material were handled and utilized within the building area, and this incurred a carbon handprint of 1.4 million kilograms CO_2-eq. Additionally, the issues to be developed regarding the data collection of soil management were identified. For future projects, sharing the fuel consumption monitoring

data of machinery and transportations would be desirable and including the contractors into the data collection process would be essential.

In order to utilize the data efficiently and automatically, it has to be collected in a structured fashion. That is why the first version of a reporting template was created during the Porvoo and Tampere pilot projects. This template acts as energy consumption, site logistics and machinery guidelines of the contractors. The reporting template has been named in a specified way so that the data is retrievable on the SokoPro interface.

The pilot case report was prepared in co-operation by Vastuu Group Oy and Sitowise Oy. In accordance with the principles specified by the project steering group, the full report is only available to the organizations that participated in the research and development project.

Further information:

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